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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/842,991 | 04/26/2001 | Gang Luo | NCRC-0038-US (9558) | 7901 |

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| EXAMINER | |
|---|---|
| CHEN, CHONGSHAN | |
| ART UNIT | PAPER NUMBER |
| 2172 | 3 |

DATE MAILED: 05/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/842,991 | LUO ET AL. | |
| | Examiner | Art Unit | |
| | Chongshan Chen | 2172 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-32 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-32 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4 and 13-24 are rejected under 35 U.S.C. 102(b) as being anticipated by T. Urhan et al. ("Urhan", "XJoin: Getting Fast Answers from slow and Bursty Networks", Technical Report, CS-TR-3994, UMIACS-TR-99-13, February 1999).

As per claim 1, Urhan discloses a method comprising:

storing first tuples in a first table in a database system (Urhan, page 4, Fig. 2, Tuple A);

storing second tuples in a second table in the database system (Urhan, page 4, Fig. 2, Tuple B);

partitioning the first and second tuples into plural portions; redistributing the first and second tuples to plural nodes according to the partitioning (Urhan, page 4, Fig. 2, Memory-resident partitions of source A, B); and

hash joining the first and second tuples to produce result tuples as the first and second tuples are being redistributed to the plural nodes (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4, page 5, "XJoin proceeds in three stages, each of which is performed by a separate thread. The first stage joins tuples in the memory resident portions of the partitions, acting similarly to the standard symmetric hash join...").

As per claim 2, Urhan teaches all the claimed subject matters as discussed in claim 1, and further discloses retrieving the result tuples once the hash join is performed (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 3, Urhan teaches all the claimed subject matters as discussed in claim 1, and further discloses retrieving the result tuples at random (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4, page 2-3).

As per claim 4, Urhan teaches all the claimed subject matters as discussed in claim 1, and further discloses producing result tuples at one of the plural nodes; and simultaneously producing result tuples at a second of the plural nodes (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

Claims 13-15 are rejected on grounds corresponding to the reasons given above for claims 1-3.

As per claim 16, Urhan teaches all the claimed subject matters as discussed in claim 13, and further discloses partitioning first tuples into first hash tables; and partitioning second tuples into second hash tables, wherein the hash tables are in the memory (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 17, Urhan teaches all the claimed subject matters as discussed in claim 16, and further discloses allocate a portion of the memory to the first hash table; allocate a second portion of the memory to the second hash table; and hash join first tuples in the first hash table with second tuples in the second hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 18, Urhan teaches all the claimed subject matters as discussed in claim 17, and further discloses determine that the portion of the memory allocated to the first hash table is full; and store first tuples in a stable storage (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 19, Urhan teaches all the claimed subject matters as discussed in claim 18, and further discloses continue to store second tuples in the second hash table; and hash join second tuples in the second hash table with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 20, Urhan teaches all the claimed subject matters as discussed in claim 19, and further discloses determine that the second portion of the memory allocated to the second hash table is full; allocate a second stable storage to the second hash table; store second tuples in the second stable storage; and hash join second tuples in the second stable storage with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 21, Urhan teaches all the claimed subject matters as discussed in claim 20, and further discloses generate a third hash table once all first tuples and second tuples are redistributed to each node; retrieve one of the first tuples from the stable storage; hash join the one of the first tuples with tuples in the second hash table; and store the one of the first tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 22, Urhan teaches all the claimed subject matters as discussed in claim 21, and further discloses retrieve one of the second tuples from the second stable storage; and hash join the one of the second tuples with tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

Claims 23-24 are rejected on grounds corresponding to the reasons given above for claims 1-2.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 5-12 and 25-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over T. Urhan et al. ("Urhan", "XJoin: Getting Fast Answers from slow and Bursty Networks", Technical Report, CS-TR-3994, UMIACS-TR-99-13, February 1999) in view of D. DeWitt et al. ("DeWitt", "Parallel Sorting on a Shared-Nothing Architecture using Probabilistic Splitting", Proc. Of the Intl. Conf. On Parallel and Distributed Information Systems (PDIS) 1991: 280-291).

As per claim 5, Urhan teaches all the claimed subject matters as discussed in claim 4, except for explicitly disclosing redistributing the first and second tuples to plural nodes comprises redistributing based on split vectors containing predefined ranges. DeWitt discloses redistributing the first and second tuples to plural nodes comprises redistributing based on split vectors containing predefined ranges (DeWitt, page 5). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine DeWitt with Urhan in order to exact splitting.

As per claim 6, Urhan and DeWitt teach all the claimed subject matters as discussed in claim 5, and further disclose partitioning first and second tuples into hash tables in each node (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 7, Urhan and DeWitt teach all the claimed subject matters as discussed in claim 6, and further disclose allocating a portion of a memory to a first hash table; allocating a

second portion of the memory to a second hash table; and hash joining first tuples in the first hash table with second tuples in the second hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 8, Urhan and DeWitt teach all the claimed subject matters as discussed in claim 7, and further disclose determining that the portion of the memory allocated to the first hash table is full; allocating a stable storage to the first hash table; and storing first tuples in the stable storage (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 9, Urhan and DeWitt teach all the claimed subject matters as discussed in claim 8, and further disclose continuing to store second tuples in the second hash table; and hash joining second tuples in the second hash table with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 10, Urhan and DeWitt teach all the claimed subject matters as discussed in claim 9, and further disclose determining that the second portion of the memory allocated to the second hash table is full; allocating a second stable storage to the second hash table; storing second tuples in the second stable storage; and hash joining second tuples in the second stable storage with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 11, Urhan and DeWitt teach all the claimed subject matters as discussed in claim 10, and further disclose generating a third hash table once all first tuples and second tuples are redistributed to each node; retrieving one of the first tuples from the stable storage; hash joining the one of the first tuples with tuples in the second hash table; and storing the one of the first tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 12, Urhan and DeWitt teach all the claimed subject matters as discussed in claim 11, and further disclose retrieving one of the second tuples from the second stable storage;

and hash joining the one of the second tuples with tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

Claims 25-32 are rejected on grounds corresponding to the reasons given above for claims 5-12.

***Conclusion***

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Liu et al. (6,263,331) disclose hybrid hash join process.

Lindsay et al. (6,226,639) disclose system and method for hybrid hash join using over-partitioning to respond to database query.

***Inquiry***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chongshan Chen whose telephone number is (703) 305-8319. The examiner can normally be reached on Monday - Friday (8:00 am - 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Y Vu can be reached on (703)305-4393. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-7239 for regular communications and (703) 746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-3900.

CC
May 16, 2003

KIM VU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100